

For at least the following reasons, Applicants strongly disagree that the Examiner has established a prima facie case that the invention of claims 1-43 would have been obvious in view of the combination of Storstrom and Dunn.

Claims 1-13 and 21-31

Claim 1 recites a method wherein at least a portion of an iron-containing metallurgical powder comprising sponge iron is compressed in a die at no greater than 20 tsi. Neither Storstrom nor Dunn teaches compressing metallurgical powders in a die at 20 tsi or less. Thus, the Examiner has not established a prima facie case that the method of claim 1 would have been obvious. To fill this very significant gap in the cited references and attempt to construct a prima facie case, the Examiner states, without support, that during routine experimentation with metallurgical powders one of ordinary skill would be drawn to use compacting pressures of 20 tsi or less "to produce a sintered body of high density". However, as is generally known in the powder metal art, increasing the compacting pressure, not lowering it, increases the density of compacts. As noted in the Subject Application, a molding pressure range of 20 tsi or less is below the conventional molding pressure range used with iron-containing metallurgical powders and, for example, "[i]t is generally believed that [] molding iron base metallurgical powders at pressures less than 20 tsi will not result in a compact having sufficient green strength [to be handled]." See Subject Application at page 4, line 22 to page 5, line 1. Thus, one of ordinary skill seeking to produce green bodies having high density from metallurgical powders would not be motivated to, and would most certainly avoid, pressing the metallurgical powder at 20 tsi or less. In fact, in the examples included in Storstrom, the samples of iron-containing metallurgical powder (Hoganas'

DISTALOY AE powder) were molded at 600, 700 and 800 MPa, which equate to about 43, about 50 and about 58 tsi, pressures that are substantially greater than 20 tsi. Thus, Storstrom actually teaches away from the use of molding pressures of 20 tsi or less and, therefore, that patent actually corroborates that one of ordinary skill would not be motivated to mold metallurgical powder at pressures of 20 tsi or less.

Even apart from the absence of a prima facie case of obviousness, Applicants also note that the method of claim 1 of the Subject Application has been shown to produce unexpected results. These unexpected results rebut the presence of any prima facie case that may be established. Moreover, the unexpected results provide many advantages over powder metal molding methods employing molding pressures in the conventional range. As noted in the Subject Application, the present inventors unexpectedly determined that compacts of iron-containing metallurgical powders including sponge iron powder had greater green strengths at a given molding pressure than powders without sponge iron. The inventors also unexpectedly discovered that certain metallurgical powders including some portion of sponge iron powder may be molded to acceptable green strengths at 20 tsi or less, molding pressures that are, as noted above, significantly lower than conventional molding pressures used with iron-containing powders. As further noted in the Subject Application, the unexpected ability to employ molding pressures that are significantly lower than conventional pressures has the advantages of reducing molding die wear; allowing the reduction or, in some cases, exclusion of internal lubricants in the metallurgical powder; and allowing the use self-lubricating die systems with reduced risk that die damage will result. The ability to reduce or eliminate internal lubricants provides several distinct advantages, including

lowering costs due to reduced materials requirements, allowing the use of inductive sintering without the need for preheating to drive off volatiles, reducing environmental concerns due reduced volatiles, and reducing the risk of cracking or reduced strength on sintering the compacts.

Accordingly, the Examiner has not established that the method recited in claim 1 would have been obvious over the cited combination of references, and the rejection of claim 1 should be withdrawn. Claims 2-12 and 21 each depend directly or ultimately from claim 1. Claim 22 recites a powder metal material formed by a method as recited in claim 1, while claims 23-31 depend directly from claim 22. Thus, because claim 1 has been shown to be patentable over the cited references, it follows that claims 2-12 and 21-31 also are patentable over the references.

Claims 13-20 and 32-43

Claim 13 is directed to a method of forming a powder metal material wherein the method includes compressing in a die at least a portion of a metallurgical powder including sponge iron and at least one of an atomized iron powder and an atomized iron-containing powder. The green compact is subsequently sintered. In the Office Action, the Examiner apparently concludes that the above-discussed combination of Storstrom and Dunn would have rendered the invention recited in claim 13 obvious. Applicants respectfully disagree for at least the following reasons.

With regard to establishing a prima facie case of obviousness, Applicants submit that the combination of references does not teach each of the claim limitations of claim 1. In addition, Applicants refer the Examiner to the above discussion of unexpected results. In that discussion, and in the Subject Application, Applicants noted that certain

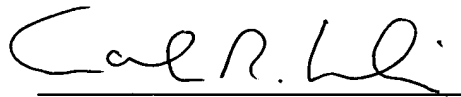
unexpected results were achieved when molding powders including at least a portion of sponge iron powder. For example, the present inventors unexpectedly determined that compacts of iron-containing metallurgical powders including sponge iron powder had greater green strengths at a given molding pressure than powders lacking sponge iron. The inventors also unexpectedly discovered that certain metallurgical powders including some portion of sponge iron powder may be molded to acceptable green strengths at 20 tsi or less, molding pressures that are significantly lower than conventional molding pressures used with iron-containing powders.

Accordingly, the Examiner has not established that the method recited in claim 13 would have been obvious over the cited combination of references, and the rejection of claim 13 should be withdrawn. Claims 14-20 each depend directly from claim 13. Claim 32 recites a powder metal material formed by a method as recited in claim 13, while claims 33-41 each depend directly from claim 32. Thus, because claim 13 has been shown to be patentable over the cited references, Applicants submit that claims 14-20 and 32-41 also are patentable over those references. Claims 42 and 43 each depend in the alternative from claims 22 and 32. Claims 42 and 43 are patentable for the reason that each of claims 22 and 32 has been shown to be patentable over the cited references.

CONCLUSION

Applicants respectfully submit that each of claims 1-43 pending in the Subject Application should be held patentable over the cited references. Accordingly, passage of the claims to allowance at an early date is requested. Should the Examiner disagree that one or more of the claims are in condition for allowance, he is asked to contact the undersigned by phone so that any concerns may be addressed without the need to issue an additional office action.

Respectfully submitted,



Mark R. Leslie
Registration No. 36,360
Attorney for Applicants

Kirkpatrick & Lockhart LLP
Henry W. Oliver Building
535 Smithfield Street
Pittsburgh, Pennsylvania 15222-2312

Telephone: 412/355-6271
Facsimile: 412/355-6501